EBI Consulting
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Radio Frequency Emissions Compliance Report For Verizon Wireless

Site Name: Class A Pole **Site Structure Type:** Utility Pole
Report Date: August 19, 2019 **Project:** New Build

General Summary

Verizon Wireless has contracted EnviroBusiness Inc. (dba EBI Consulting) to conduct a Radio Frequency Electromagnetic Compliance assessment of the proposed Class A Pole site configuration to be deployed on utility poles. This report contains information about the radio telecommunications equipment to be installed at this site and the surrounding environment with regard to RF Hazard compliance. This assessment is based on installation designs and operational parameters provided by Verizon Wireless.

The compliance framework is derived from the Federal Communications Commission (FCC) Rules and Regulations for preventing human exposure in excess of the applicable Maximum Permissible Exposure ("MPE") limits. At any location at this site, the power density resulting from each transmitter may be expressed as a percentage of the frequency-specific limits and added to determine if 100% of the exposure limit has been exceeded. The FCC Rules define two tiers of permissible exposure differentiated by the situation in which the exposure takes place and/or the status of the individuals who are subject to exposure. General Population / Uncontrolled exposure limits apply to those situations in which persons may not be aware of the presence of electromagnetic energy, where exposure is not employment-related, or where persons cannot exercise control over their exposure. Occupational / Controlled exposure limits apply to situations in which persons are exposed as a consequence of their employment, have been made fully aware of the potential for exposure, and can exercise control over their exposure. Based on the criteria for these classifications, the FCC General Population limit is considered to be a level that is safe for continuous exposure time. The FCC General Population limit is 5 times more restrictive than the Occupational limits.

Frequency (MHz)	*Limits for General Population/ Uncontrolled Exposure*		*Limits for Occupational/ Controlled Exposure*	
	Power Density (mW/cm^2)	Averaging Time (minutes)	Power Density (mW/cm^2)	Averaging Time (minutes)
30-300	0.2	30	1	6
300-1500	f/1500	30	f/300	6
1500-100,000	1.0	30	5.0	6

F=Frequency (MHz)

In situations where the predicted MPE exceeds the General Population threshold in an accessible area as a result of emissions from multiple transmitters, FCC licensees that contribute greater than 5% of the aggregate MPE share responsibility for mitigation.

EBI Consulting has performed theoretical modeling using RoofMaster™ software to predict the overall MPE possible at any particular location given the spatial orientation and operating parameters of multiple RF sources. Using the computational methods set forth in Federal Communications (FCC) Office of Engineering & Technology (OET) Bulletin 65, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" (OET-65), RoofMaster™ calculates predicted power density in a scalable grid based on the contributions of all RF sources characterized in the study scenario. At each grid location, the cumulative power density is expressed as a percentage of the FCC limits. Manufacturer antenna pattern data is utilized in these calculations.

RoofMaster™ models consist of the Far Field model as specified in OET-65 and an implementation of the OET-65 Cylindrical Model (Sula9). The models utilize several operational specifications for different types of antennas to produce a plot of spatially-averaged power densities that can be expressed as a percentage of the applicable exposure limit.

The power density in the Far Field of an RF source is specified by OET-65 Equation 5 as follows:

$$S = \frac{EIRP}{4 \cdot \pi \cdot R^2} \ (mW/cm^2)$$

Where EIRP is the Effective Radiated Power relative to an isotropic antenna and R is the distance between the antenna and point of study. Additionally, consideration is given to the manufacturers' horizontal and vertical antenna patterns as well as radiation reflection. At any location, the predicted power density in the Far Field is the spatial average of points within a 0 to 6 foot vertical profile that a person would occupy. Near field power density is based on OET-65 Equation 20 stated as:

$$S = \left(\frac{180}{\theta_{BW}}\right) \cdot \frac{100 \cdot P_{in}}{\pi \cdot R \cdot h} \ (mW/cm^2)$$

Where P_{in} is the power input to the antenna and h is the aperture length. These theoretical results represent worst-case predictions as emitters are assumed to be operating at 100% duty cycle.

For any area in excess of 100% General Population MPE limits, access controls with appropriate RF alerting signage must be put in place and maintained to restrict access to authorized personnel. Signage must be posted to be visible upon approach from any direction to provide notification of potential conditions within these areas. Subject to other site security requirements, occupational personnel should be trained in RF safety and equipped with personal protective equipment (e.g. RF personal monitor) designed for safe work in the vicinity of RF emitters. Controls such as physical barriers to entry imposed by locked doors, hatches and ladders or other access control mechanisms may be supplemented by alarms that alert the individual and notify site management of a breach in access control. EBI Consulting recommends that any work activity in these designated areas or in front of any transmitting antennas be coordinated with all wireless tenants.

Analysis

Verizon Wireless proposes to mount a Commscope 4G antenna and Nokia 5G antennas on a utility pole with centerlines at 47'-9" and 44'-7", respectively, above ground level. The proposed operating parameters are listed in the table below:

Proposed Operation Parameters

Freq (MHz)	Model	Gain (dBd)	Orientation (Deg.)	Mech. Downtilt (Deg.)	Rad Center (ft AGL)	Total EIRP (W)
1900 2100 3500	Commscope VVSSP-360S-F	4.54 5.04 2.87	260	0	47.9	422.3
28000	Nokia AEUA	23.04	20 140 260	5 5 4	44.7	761.2

Other appurtenances such as cabling are not sources of RF emissions.

Power density decreases significantly with distance from any antenna. The antennas to be employed at this site are directional by design and the mounting elevation, as documented, serves to reduce the potential to exceed MPE limits at any location other than directly in front of the antennas. For accessible areas at ground level, the maximum predicted power density level resulting from all Verizon Wireless operations is 0.5% of the FCC General Population limits. The proposed operation will not expose members of the General Public to hazardous levels of RF energy level and will not contribute to existing cumulative MPE levels on walkable surfaces at ground by 5% of the FCC General Population limits.

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On the pole, predicted MPE levels will not exceed the FCC General Population limits beyond 7 feet of the antennas horizontally and 3 feet of the antennas vertically. EBI Consulting recommends posting RF alerting signage (Notice) on the pole visible upon approach that informs personnel accessing this area of basic precautions to be followed when working around antennas. These recommendations are depicted in Figure 1. Any work activity in front of transmitting antennas should be coordinated with Verizon Wireless.

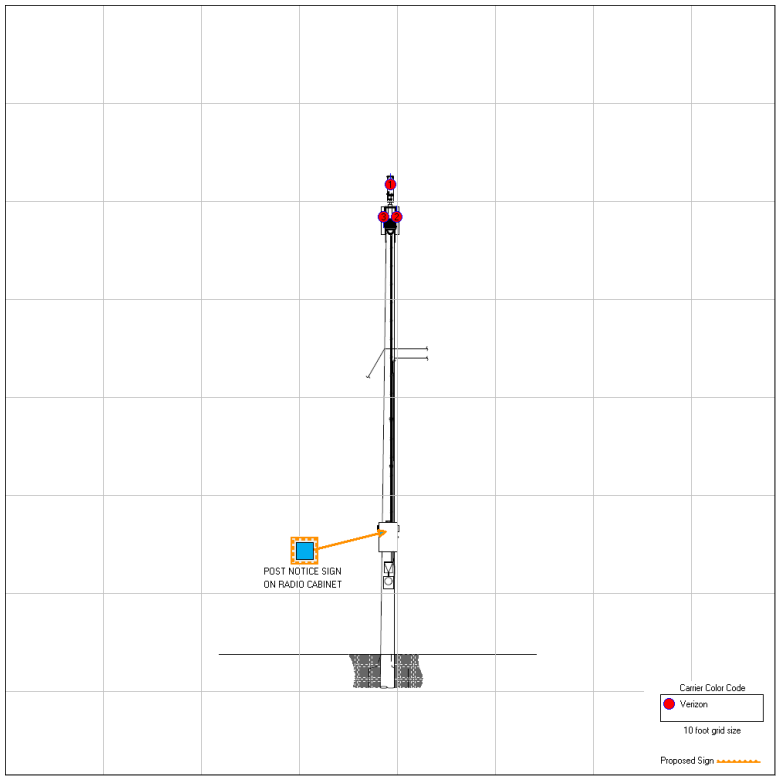

Figure 1: Sign Posting Recommendations

Compliance Statement

Based on information provided by Verizon Wireless, predictive modeling and the mitigation action to be implemented by Verizon Wireless, the Class A Pole installation proposed by Verizon Wireless will be compliant with Radiofrequency Radiation Exposure Limits of 47 C.F.R. § 1.1307(b)(3) and 1.1310.

Certification

I, Onofre Mayuga, am the reviewer and approver of this report and am fully aware of and familiar with the Rules and Regulations of both the Federal Communications Commissions (FCC) and the Occupational Safety and Health Administration (OSHA) with regard to Human Exposure to Radio Frequency Radiation, specifically in accordance with FCC's OET Bulletin 65. I have reviewed this Radio Frequency Exposure Assessment report and believe it to be both true and accurate to the best of my knowledge.

08/20/19